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point of view, and a positive, constructive contribution toward the solution of the problem of more effective botanical teaching.

Chapter I. should be learned by heart and taken to heart by every earnest teacher. The chapter-headings are substantially the same as those in the first edition, while the appendix includes the "Unit Course in Botany Formulated by a Committee of the Association of Colleges and Secondary Schools of the North Central States", as well as the "Course of the Botanical Society of America and the College Entrance Examination Board".

Teachers of all grades, experienced and inexperienced, cannot fail to derive both profit and inspiration from this admirable volume.

C. STUART GAGER

THE BROOKLYN BOTANIC GARDEN

OF INTEREST TO TEACHERS

SOME FALLACIES OF BOTANY TEACHERS

Among the fallacies enumerated by Joseph Y. Bergen in *School Science and Mathematics* for December, 1909, the following paragraphs seem of special interest.

"There is beginning to be a vigorous demand, perhaps most noticeable in parts of the middle west, for a highly 'practical,' *i. e.*, economic, kind of instruction in botany and zoölogy. It is felt that, for one thing, the teaching should be so shaped as to make use of the commonest garden and field plants to illustrate plant anatomy and physiology. Of course no teacher in his senses would hunt up a rare greenhouse orchid to demonstrate a point which could be equally well shown by the use of a garden lily, a hyacinth, or an onion. But, * * * there is a very specious fallacy in the unqualified insistence on the use of common material. * * * The cabbage is a most familiar plant, therefore let us make stomata easy for him by giving him cabbage leaves to histologize. Now a single trial would convince any unbiased teacher that the familiar cabbage leaf is not nearly as easy a subject for the study of stomata as are easily peeled leaves, like those of the iris, or firm ones for cross sectioning, like those of

Cycas. So, too, the fact that the common bean is a highly useful plant and *Sedum* or *Trillium* is not would still leave the bean flower much the poorest of the three with which to begin the study of floral structures.

"A still more radical phase of the movement toward economic biology appears in the demand for lessons on all sorts of topics bearing on horticulture and farming, from injurious insects to plant breeding. Doubtless in some country high schools a good deal of such work can be made thoroughly interesting and profitable. And in any schools such matter, in very moderate amounts, may properly be assigned for supplementary reading. Leaving out business and other technical courses, however, when one begins to make economic consideration the measure of educational values he begins to pile up absurdities. As soon as the teachers of geography, history and geometry are willing to bend most of their respective efforts toward instruction regarding commercial routes, the alternation of periods of activity and depression in the world's business, and mensuration, it will be time for biology teachers to consider favorably corresponding pseudo-utilitarian innovations. But if the most valuable crop that any country can produce is intelligent men it must follow that any kind of study which is preëminently suited to cultivate habits of careful observation and orderly thinking in school children is especially important. Then that kind of biology which gives young people some adequate conception—partly obtained from their own field and laboratory studies—of the animal and plant inhabitants of the earth, is better worth while than that which primarily leads to more abundant hay, grain, butter and pork making. In other words, we can develop the faculties of a boy faster and further (and therefore do more for the world) by setting him to work on the structure and functions of the corn plant than by making him count and weigh the kernels of a half dozen ears of as many improved varieties of corn. Such counting and weighing, unless they form part of an extended, systematic investigation carried on by the student, have no more educational value than keeping tally of the loads of coal sent out by a fuel company.

"There has been among teachers of botany an idea, now fast vanishing, that ecology is at once the easiest and the most interesting department of the science. * * * High school pupils can learn a few useful facts about such matters as heliotropic and geotropic movements of plants, the occurrence and meaning of deciduousness among trees, insect pollination, competition, the concept of a plant formation and a plant association. Further they cannot profitably go.

"Though the belief that plant ecology is 'easy' is obsolescent, an equally pernicious notion that plant physiology is 'hard' still prevails. It has, in some instances, gone so far as to lead to something perilously near to the complete omission of the subject from the text-books and the class work. Of course the more recondite matters, such as the causes of the movements of liquids in the plant body, the precise function and *modus operandi* of stomatal movements, the details of sexual reproduction in many groups, and a host of other topics are difficult enough to tax the energies of a Pfeffer, a Strasburger, or a DeBary. But there are so many simple, manageable things for the young beginner to work out! It is far easier for him to discover for himself the fact and roughly to measure the amount of transpiration, to prove the dependence of starch production on light, and roughly to ascertain the temperature limits within which germination of a given kind of seed is possible than to learn by his own observations anything worth while about fibro-vascular bundles or even to master the details of pollination in *Asclepias* or most orchids.

"A few words should here be said about the very prevalent idea, that since plants have been evolved from the unicellular condition to that of the most complicated assemblage of structures found among seed plants, the pupil's knowledge of them should be gained along the same road. Perhaps with students of twenty this might be true, though one of the best all-round teaching professors of botany whom I have known, found that his classes of college beginners in the subject could not do anything like the year's work when they began with the cell as a unit that they could and did when they began with readily visible and somewhat familiar forms. It is doubtful whether the

English-speaking world has ever known a more successful teaching biologist than Huxley and there are still some of us who remember how he reversed the order of treatment in his *Biology*, after a thorough trial of the evolutionary order in the first edition. . . .

"To me it has always seemed a wrong done to the learner to give him a specially coined Greek derivative where a single English word or a manageable compound will serve. Seed-plant, rootstock, sac-fruit, for those who are not and are not to become technical botanists, are just as good terms as spermatophyte, rhizome, and ascocarp, while they are far easier to learn and to remember. It is indeed a pity that we have not a host of simple terms like the German *Keimblatt*, *Markstrahl*, and so on, but let us use what we have."

Upham's *Introduction to Agriculture* is designed for the eighth grade, but it contains much that is more simply told than in many of our high school text-books. Any high school teacher of botany (and zoölogy) will find it a very helpful addition to the class library.

A double flowering dogwood is reported in *Science* (June 10) by F. L. Stevens and J. G. Hall. There is an "excessive development of the small bracts that subtend the individual flowers of the ordinary head" and a "suppression of all the individual flowers except the central one which appeared entirely normal."

In *Science* for August 12, Professor T. D. A. Cockerell makes a plea for the better care of types—for their more careful housing and for stricter rules concerning the loaning of type specimens to individuals and to institutions. Professor Cockerell considers a type "from its nature, in some sense the property of the scientific world."

In Buller's *Research on Fungi* (1909) spore ejection was proven by means of a beam of light. It is stated that "ejection is independent of hygroscopic conditions, takes place but slowly at 0°, and is stopped by anesthetics and by lack of oxygen. It is

therefore a phenomenon of protoplasmic activity, not a mere result of hygroscopic tension."

In *Science* (July 8) Albert Schneider referring to the botanical garden symposium papers (A. A. A. S. of Boston) pleads for "practical significance" in the experimental work of botanical gardens; he also insists that in such gardens and experiment stations the major part of the work should be establishing and developing new plant industries.

Recently a Montclair (N. J.) magistrate imposed a twenty dollar fine on an electric light employe who cut the tops from two trees to make room for wires. Such conscious and wilful law-breaking is too rarely thus treated; and consequently, as the New York *Tribune* says, "with all our Arbor Day formalities and all our praiseworthy talk of conservation, the destruction of trees as the victims of laziness or sordidness goes on at a discreditable rate."

Governor Hadley of Missouri is one of a group of progressive western men who are planning to establish farm colonies of families who have the capacity and the ambition essential to make a success of farming, but who never can, under present conditions of living, obtain the capital required for the transfer from the city to the country.

A colony would include several forty acre farms with a central model farm. According to the *Outlook*, that would be occupied by a director, an expert agriculturist. Dr. F. van Eeden, the Dutch sociologist and writer, is planning a colony of Dutch farmers near Wilmington (N. C.), which will also be a practical illustration of social organization.

The future wheat supply of the United States from the point of view of (1) increase in wheat acreage and (2) increase in acre yields is discussed by Professor M. A. Carleton in a recent *Science* (August 5). The first may be reached by an expansion in the farm area or by devoting a larger percentage of the present farm

area to wheat. Professor Carleton calculates that by 1950 the "improved farm area" will reach 760,000,000 acres, and that there will also be a gain in the percentage of farm land devoted to wheat, giving 76,000,000 acres of wheat land. In the last forty years there has been a gain of 1.8 bushels to an acre; by 1950 a yield of 16.8 bushels per acre is predicted—a gain of 2.7 bushels per acre. The methods of increasing the acre yield: (1) the introduction of better adapted varieties, (2) hybridization and selection in existing varieties, and (3) better methods of cultivation are discussed. Professor Carleton states that the most important introduced wheats were those of the Fife (brought from eastern Europe through Scotland and Canada into the northern states of the plains) and from Crimea or Turkey (brought from the Crimea and established in the middle states of the plains). The combined output of these two types of wheat now comprises nearly the entire wheat production of the country. These wheats have not only extended the area to the north and west but have increased the acre yield. Credit is given the U. S. Department of Agriculture for much improvement in existing varieties by selection and by hybridization. Yet, that and the improvement due to progressive farming methods are deemed but in their infancy.

Recent study by K. F. Kellerman and J. R. Robinson, of the Bureau of Plant Industry, shows that the presence of magnesium carbonate (0.25 per cent. or over) is "positively inhibitive to nitrifying action; *i. e.*, toxic to the bacteria so important to the nutrition of plants". Calcium carbonate is favorable up to two per cent. Fairly pure calcium carbonate should therefore be used in liming soils already containing magnesium.

At the third International Botanical Congress held in Brussels in May some new rules on nomenclature were formulated. Linnaeus's *Species Plantarum*, 1753, is to be retained as the starting point for the myxomycetes, lichens, and liverworts; but more recent authorities are to be used for fungi (1801, Persoon, and 1821-32, Fries); for algae (Linnaeus in part; 1848, Rolfs; 1886-

88, Bornet and Flahault; 1900, Hirn; and 1892-93, Gomont); and for mosses (1801-30, Hedwig).

NEWS ITEMS

The death of Samuel Bowdlear Green, dean of the school of forestry and the University of Minnesota, has recently been announced.

E. Dwight Sanderson, of the New Hampshire Agricultural Experiment Station, has been made dean of the College of Agriculture, West Virginia University.

Professor Edward W. Berry, associate professor in paleobotany at Johns Hopkins University, has recently been appointed geologist on the United States Geological Survey.

Arthur W. Merrill, of the Baron de Hirsch School, has been made director of the secondary school of agriculture to open in Vermont at Lyndon Institute, Lyndon, Vermont. A two-year course in scientific agriculture, planned to prepare young men for "successful farming under Vermont conditions" is offered to residents of the state. The school has been made possible through a gift by Theodore N. Vail; and two methods of paying expenses—by cash or by work—are offered the students.

The fall lectures at the New York Botanical Gardens are to be given at four on Saturdays, as usual. The program includes: Orchids, Wild and Cultivated, by Mr. G. V. Nash, September 17; The Botanical Gardens of Europe, by Dr. W. A. Merrill, September 24; Some Floral and Scenic Features of Jamaica, by Dr. M. A. Howe, October 1; Carnivorous Plants, by Professor H. M. Richards, October 8; Autumn Flowers, by Dr. N. L. Britton, October 15; Plant Diseases and their Control, by Mr. F. J. Seaver, October 22; Explorations in Santo Domingo, by Mr. N. Taylor, October 29; The Flora of Switzerland, by Professor E. L. Burgess, November 5; Some Economic Plants of Mexico, by Professor H. H. Rusby, November 12; and Cuba, Its Flora and Plant Products, by Dr. N. L. Britton, November 19.